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Agricultural Research Administration
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TUMBLING EQUIPMENT FOR RECOVERY OF INSECTICIDE RESIDUES

By C. H. Batchelder and O. E. Berndt
Division of Cereal and Forage Insect Investigations

Tumbling equipment for removing insecticide residues from corn plants is necessary in processing field samples for analytical determinations. Several types of tumbling equipment are in use. The machine described here has a capacity of 10 sample jars of 2 1/2 gallons each. It was assembled and used at the Toledo, Ohio, laboratory of this Bureau for rolling glass jars containing sectioned corn plants and benzene.[1/] Samples of the benzene stripping fluid were then removed and shipped to chemical laboratories for residue analysis. This procedure overcame difficulties encountered previously when samples were either dried or packed green for shipment.

The machine consists of a stand on which three 80-inch rubber-covered rollers are mounted. The rollers support glass jars and turn them, as shown in figure 1. Since the jars are turned at a speed of 23 revolutions per minute, the plant material is tumbled sufficiently to expose all surfaces to moving fluid.

Parts and Their Assembly

The rectangular frame forming the top of the stand and the guard rails at each end of the frame (figs. 1, 2, and 8) were welded at the corners. All other parts were bolted together. The legs and top frame were of 1/4- by 2- by 2-inch angle iron. Guard rails, to prevent the glass barrels from rotating clear of the rollers, were of 1/8- by 1- by 1-inch angle iron bolted to the frame. Flat iron, 1/4 by 1 1/2 inch, was used for bracing the stand and for supporting the electric motor (figs. 3, 4, and 7).

1/ The use of horizontal rollers in the design of this machine was suggested by J. E. Fahey, Division of Insecticide Investigations of this Bureau.

Figure 1.--Tumbling machine for rolling samples of corn and benzene stripping fluid in glass barrel jars when processing plant material for residue analysis.

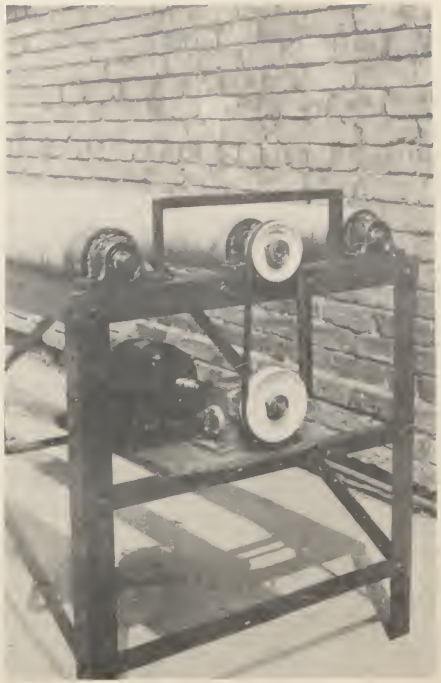
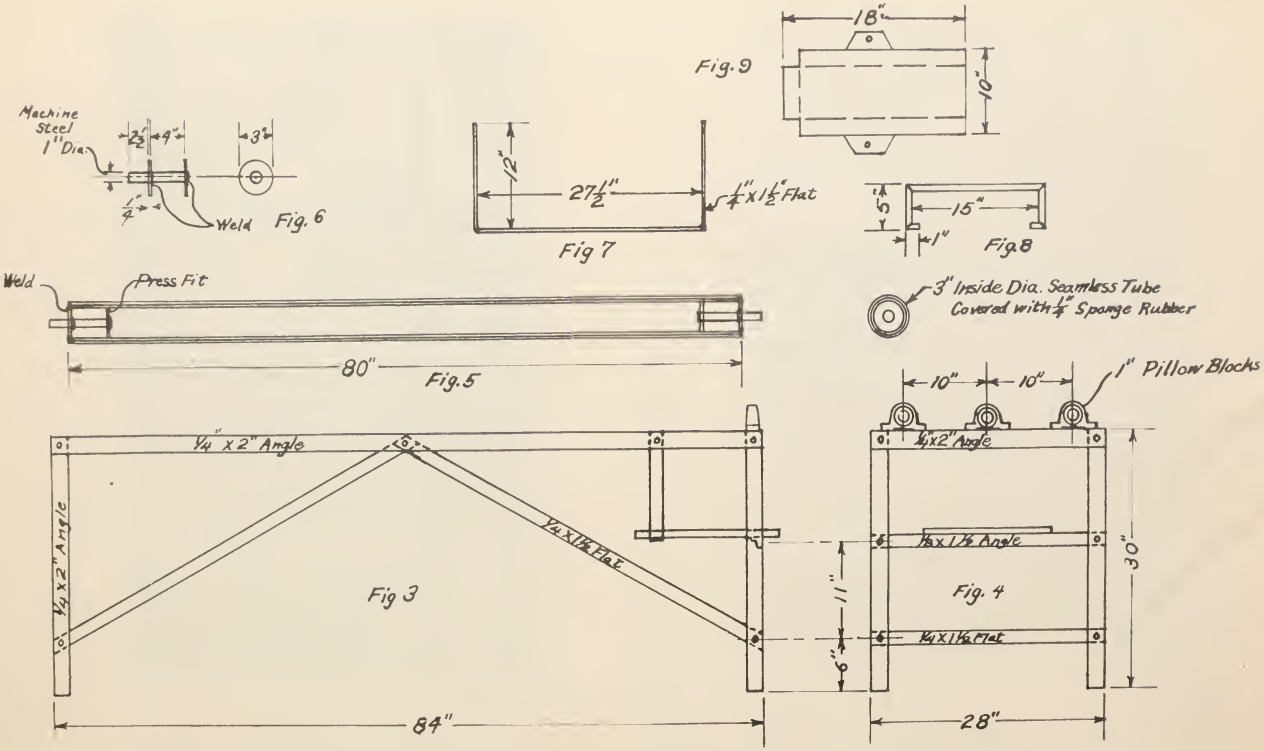


Figure 2.--Power end of tumbling machine, showing construction of frame, power transmission, and rubber-covered rollers. Metal cover removed to show belt and pulleys.

The three rollers were constructed similarly, each consisting of 3 1/2-inch (outside diameter) seamless. steel tubing. The tubes are supported at each end by 1-inch shafting, on which were welded 1/4- by 3-inch disks (figs. 5 and 6). Both disks have a press fit to the inside of the tube and the outside disk is welded to the end of the tube. Pillow-block bearings support the shafts (fig. 2). Each shaft extends 2 1/2 inches beyond the ends of the tubes, except at the power end of the center roller, from which it projects 3 1/2 inches to take a pulley. A 1/4- by 12- by 80-inch piece of sponge rubber was cemented to each tube, using weather-strip cement.

The electric motor rests on a plywood board supported by a 1 1/2-inch, flat steel hanger (fig. 7), and a 1 1/2-inch angle iron brace that extends between the legs (fig. 2). A flexible, steel coupling connects the motor shaft with a 100:1 gear-reduction box. A 5-inch pulley on the gear box and a V-belt were used to drive a 4-inch pulley on the projecting shaft of the center roller (fig. 2). Greater or less speed of rotation may be obtained by changing the size of the pulleys. As a safety measure, a metal cover was fitted over the pulleys and bolted to the frame. Figure 9 shows dimensions of the flat piece of 16-gage sheet iron before the sides and top were bent at right angles to form the box.

The cost of all parts used in the assembly of this machine at Toledo, Ohio, in August 1949 was $103.74.



Figures 3-9. --Details of construction of tumbling machine.

List of Parts

Stand:
- Top frame: 2- by 2- by 1/4-inch angle iron, two pieces 84 inches long, and two pieces 28 inches long
- Legs: 2- by 2- by 1/4-inch angle iron, four 30 inches long each
- Braces: 1 1/2- by 1/4-inch flat iron, four 48 inches long and two 28 inches long
- Guard rails: 1- by 1- by 1/8-inch angle iron, total 26 inches long

Rollers:
- Seamless steel tubing: Three lengths, 80 by 3 1/2 inches
- Cold-rolled steel shafting: Five lengths, 7 by 1 inch, one length, 8 by 1 inch
- Steel disks: Two for each shaft, 3 by 1/4 inch
- Pillow-block bearings: Six to take 1-inch shafting, self-aligning, ball-bearing
- Sponge rubber: Three pieces, 1/4 by 12 by 80 inches

V-pulleys:
- For gear-box shaft: 4-inch diameter, 1/2-inch hub
- For center roller shaft: 5-inch diameter, 1-inch hub
- V-belt: 12-inch center, 1/2-inch width

Gear box:
- Ratio 100:1 gear reduction, No. 2, horizontal, parallel compound

Motor, 1/4 hp., 1,725 r.p.m.:
- Motor bed: 16- by 12- by 1/2-inch plywood. Also supports the gear box
- Front motor-bed support: 1 1/4- by 1 1/4- by 1/8-inch angle iron bolted to stand legs
- Rear motor-bed hanger: 1 1/2- by 1/4-inch flat iron, U-shape

Shaft coupling: Motor to gear box, 1/2 inch, flexible with nonmetallic insert

Cover for pulleys and belt: 10 by 18 inches, 16-gage sheet steel

Bolts with nuts:
- Machine: Thirty-four 3/8 by 1 inch, and six 1/4 by 1 inch
- Stove: Eight 1/4 by 1 1/2 inch

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